

WHAT IS CLAIMED IS:

1. An ester base stock for a two-cycle engine oil composition, said base stock consisting essentially of a blend of (a) a first polyol ester comprising, as its reactive components, a neopentylpolyol and a C₁₆-C₂₀ branched chain, saturated monocarboxylic acid and (b) a second polyol ester comprising, as its reactive components, a neopentylpolyol and a carboxylic acid selected from the group consisting of at least one C₅-C₁₀ straight chain, saturated monocarboxylic acid, or at least one C₁₆-C₂₀ straight or branched chain, unsaturated monocarboxylic acid; and, optionally, a relatively low molecular weight ester comprising, as its reactive components, a C₈-C₁₃ straight or branched chain monohydric alcohol and a C₅-C₁₂ straight or branched chain carboxylic acid, said ester base stock having the following characteristics:

- (i) biodegradability of $\geq 80\%$, as determined by CEC-L-33-T-82;
- (ii) flash point of $\geq 175^{\circ}\text{C}$; and
- (iii) kinematic viscosity of less than 15 cSt at 100°C .

2. An ester base stock as claimed in claim 1, wherein the neopentylpolyol component of said first and said second ester is selected from the group consisting of trimethylolpropane, pentaerythritol, ditrimethylolpropane, dipentaerythritol, neopentylglycol, trimethylolethane and mixtures of two or more of said neopentylpolyols.

3. An ester base stock as claimed in claim 2, wherein the acid component of said first ester is isostearic acid, and the acid component of said second

ester is selected from (i) the group consisting of caproic acid, caprylic acid, pelargonic acid, capric acid, and mixtures of two or more of said straight chain, saturated monocarboxylic acids, or (ii) the group consisting of palmitoleic acid, oleic acid, and mixtures of said unsaturated monocarboxylic acids.

4. An ester base stock as claimed in claim 1, consisting essentially of from about 10% to about 65% of said first ester and from about 35% to about 90% of said second ester, based on the weight of said ester base stock.

5. An ester base stock for a two-cycle engine oil composition, consisting essentially of from about 20% to about 60% of trimethylolpropane triisostearate and from about 40% to about 80% of trimethylolpropane tripelargonate, based on the weight of said ester base stock.

6. An ester base stock as claimed in claim 5, consisting essentially of about 42% trimethylolpropane triisostearate and about 58% of trimethylolpropane tripelargonate, based on the weight of said ester base stock.

7. An ester base stock for a two-cycle engine oil composition, consisting essentially of from about 15% to about 55% of trimethylolpropane triisostearate and from about 45% to about 85% of an ester comprising, as its reactive components, trimethylolpropane and a mixture of caprylic acid and capric acid, based on the weight of said ester base stock.

8. An ester base stock as claimed in claim 7, consisting essentially of about 49% trimethylolpropane triisostearat and about 51% of an ester comprising, as its reactive components, trimethylolpropane and a mixture of caprylic acid and capric acid, based on the weight of said ester base stock.

9. An ester base stock for a two-cycle engine oil composition, consisting essentially of from about 35% to about 90% of trimethylolpropane triisostearate and from about 10% to about 65% of trimethylolpropane trioleate, based on the weight of said ester base stock.

10. An ester base stock as claimed in claim 9, consisting essentially of about 75% trimethylolpropane triisostearate and about 25% trimethylolpropane trioleate, based on the weight of said ester base stock.

11. An ester base stock for a two-cycle engine oil composition, consisting essentially of from about 35% to about 70% of trimethylolpropane triisostearate and from about 30% to about 65% of a mixture of C₅-C₉ saturated monocarboxylic acids, based on the weight of said ester base stock.

12. An ester base stock as claimed in claim 11, consisting essentially of about 55% trimethylolpropane triisostearate and about 45% of a mixture of C₅-C₉ straight chain saturated monocarboxylic acids, based on the weight of said ester base stock.

442,723 "0336800

SUB
B1

13. A biodegradable two-cycle engine oil composition comprising:

(A) an ester base stock consisting essentially of a blend of (a) a first polyolester comprising, as its reactive components, a neopentylpolyol and a C_{16} - C_{20} branched chain saturated monocarboxylic acid and (b) a second polyol ester comprising, as its reactive components, a neopentylpolyol and a carboxylic acid selected from the group consisting of at least one C_5 - C_{10} straight chain, saturated monocarboxylic acid or at least one C_{16} - C_{20} straight or branched chain, unsaturated monocarboxylic acids; and, optionally, a relatively low molecular weight ester comprising, as its reactive components, a C_8 - C_{13} straight or branched chain monohydric alcohol and a C_5 - C_{12} straight or branched chain carboxylic acid, said ester base stock having the following characteristics:

- (i) biodegradability of $\geq 80\%$, as determined by CEC-L-33-T-82;
- (ii) flash point of $\geq 175^\circ\text{C}$; and
- (iii) kinematic viscosity of less than 15 cSt at 100°C ; and

(B) a detergent/dispersant additive, said composition having the following characteristics:

- (i) biodegradability of $\geq 80\%$, as determined by CEC-L-33-T-82;
- (ii) flash point of $\geq 175^\circ\text{C}$;
- (iii) kinematic viscosity of less than 15 cSt at 100°C ; and
- (iv) miscibility with gasoline, in a fuel/oil ratio of 16:1 to 100:1, of $\leq 110\%$ of reference oil, as determined by ASTM-4682, using Citgo-93738 as said reference oil for category 3, according to SAE J1536.

2025 RELEASE UNDER E.O. 14176

Sub
B2

14. A biodegradable two-cycle engine oil composition, as claimed in claim 13, including an ashless additive selected from the group consisting of a polyamide, an alkenylsuccinimide, a boric acid-modified alkenylsuccinimide, a phenolic amine, a succinate derivative or a combination of any two or more of said additives.

15. A biodegradable two-cycle engine oil composition, as claimed in claim 13, including an ash-containing additive selected from the group consisting of sulfonate phosphonate, an alkaline earth metal, phenate, or a combination of any two or more of said additives.

16. A biodegradable two-cycle engine oil composition as claimed in claim 13, comprising from about 80% to about 90% of said ester base stock and from about 10% to about 20% of said performance additive, based on the weight of said composition.

17. A biodegradable two-cycle engine oil composition, as claimed in claim 14, comprising about 85% of an ester base stock, consisting essentially of a blend of trimethylolpropane triisostearate and trimethylolpropane tripelargonate in a weight ratio of about 0.7:1.0, and about 15% of said additive, said percentages being based on the weight of said composition.

18. A biodegradable two-cycle engine oil composition, as claimed in claim 14, comprising about 85% of an ester base stock consisting essentially of a blend of trimethylolpropane triisostearate and an ester comprising, as its reactive components, trimethylolpropane and a mixture of caprylic acid and

about 15% of said additive, said composition being based on the weight of said composition.

19. A biodegradable two-component composition, as claimed in claim 14, comprising an ester base stock consisting of ethylolpropane triisostearate and ethylolpropane trioleate in a weight ratio of 3.0:1.0, and about 15% of said additive, said composition being based on the weight of said composition.

19. A biodegradable two-component composition, as claimed in claim 14, comprising an ester base stock consisting of ethylolpropane triisostearate and ethylolpropane trioleate in a weight ratio of 3.0:1.0, and about 15% of said additives being based on the weight of said ester base stock.

20. A biodegradable two-cycle engine oil composition, as claimed in claim 14, comprising about 85% of an ester base stock consisting essentially of 1,3-bis(4-ethylolpropane triisostearate) and a mixture of C₅ to C₁₅ straight chain saturated monocarboxylic acids, in a weight ratio of about 1.2:1.0, and about 15% of said additives, said percentages being based on the weight of the oil composition.

21. An ester base stock for a two-cycle oil composition, said base stock consisting essentially of a blend of (a) a first polyol ester comprising, as its reactive components, a butylpolyol and a C₈-C₁₀ straight chain, saturated dicarboxylic acid and (b) a second complex polyol comprising, as its reactive components, a butylpolyol, a C₆-C₁₂ dicarboxylic acid and a C₅-straight or branched chain, saturated dicarboxylic acid; and, optionally, a relatively low molecular weight ester comprising, as its reactive components, a C₈-C₁₃ straight or branched chain hydroxylic alcohol and a C₅-C₁₂ straight or branched

1. The first of these is the fact that the
 2.
 3.
 4.
 5.
 6.
 7.
 8.
 9.
 10.
 11.
 12.
 13.
 14.
 15.
 16.
 17.
 18.
 19.
 20.
 21.
 22.
 23.
 24.
 25.
 26.
 27.
 28.
 29.
 30.
 31.
 32.
 33.
 34.
 35.
 36.
 37.
 38.
 39.
 40.
 41.
 42.
 43.
 44.
 45.
 46.
 47.
 48.
 49.
 50.
 51.
 52.
 53.
 54.
 55.
 56.
 57.
 58.
 59.
 60.
 61.
 62.
 63.
 64.
 65.
 66.
 67.
 68.
 69.
 70.
 71.
 72.
 73.
 74.
 75.
 76.
 77.
 78.
 79.
 80.
 81.
 82.
 83.
 84.
 85.
 86.
 87.
 88.
 89.
 90.
 91.
 92.
 93.
 94.
 95.
 96.
 97.
 98.
 99.
 100.
 101.
 102.
 103.
 104.
 105.
 106.
 107.
 108.
 109.
 110.
 111.
 112.
 113.
 114.
 115.
 116.
 117.
 118.
 119.
 120.
 121.
 122.
 123.
 124.
 125.
 126.
 127.
 128.
 129.
 130.
 131.
 132.
 133.
 134.
 135.
 136.
 137.
 138.
 139.
 140.
 141.
 142.
 143.
 144.
 145.
 146.
 147.
 148.
 149.
 150.
 151.
 152.
 153.
 154.
 155.
 156.
 157.
 158.
 159.
 160.
 161.
 162.
 163.
 164.
 165.
 166.
 167.
 168.
 169.
 170.
 171.
 172.
 173.
 174.
 175.
 176.
 177.
 178.
 179.
 180.
 181.
 182.
 183.
 184.
 185.
 186.
 187.
 188.
 189.
 190.
 191.
 192.
 193.
 194.
 195.
 196.
 197.
 198.
 199.
 200.
 201.
 202.
 203.
 204.
 205.
 206.
 207.
 208.
 209.
 210.
 211.
 212.
 213.
 214.
 215.
 216.
 217.
 218.
 219.
 220.
 221.
 222.
 223.
 224.
 225.
 226.
 227.
 228.
 229.
 230.
 231.
 232.
 233.
 234.
 235.
 236.
 237.
 238.
 239.
 240.
 241.
 242.
 243.
 244.
 245.
 246.
 247.
 248.
 249.
 250.
 251.
 252.
 253.
 254.
 255.
 256.
 257.
 258.
 259.
 260.
 261.
 262.
 263.
 264.
 265.
 266.
 267.
 268.
 269.
 270.
 271.
 272.
 273.
 274.
 275.
 276.
 277.
 278.
 279.
 280.
 281.
 282.
 283.
 284.
 285.
 286.
 287.
 288.
 289.
 290.
 291.
 292.
 293.
 294.
 295.
 296.
 297.
 298.
 299.
 300.
 301.
 302.
 303.
 304.
 305.
 306.
 307.
 308.
 309.
 310.
 311.
 312.
 313.
 314.
 315.
 316.
 317.
 318.
 319.
 320.
 321.
 322.
 323.
 324.
 325.
 326.
 327.
 328.
 329.
 330.
 331.
 332.
 333.
 334.
 335.
 336.
 337.
 338.
 339.
 340.
 341.
 342.
 343.
 344.
 345.
 346.
 347.
 348.
 349.
 350.
 351.
 352.
 353.
 354.
 355.
 356.
 357.
 358.
 359.
 360.
 361.
 362.
 363.
 364.
 365.
 366.
 367.
 368.
 369.
 370.
 371.
 372.
 373.
 374.
 375.
 376.
 377.
 378.
 379.
 380.
 381.
 382.
 383.
 384.
 385.
 386.
 387.
 388.
 389.
 390.
 391.
 392.
 393.
 394.
 395.
 396.
 397.
 398.
 399.
 400.
 401.
 402.
 403.
 404.
 405.
 406.
 407.
 408.
 409.
 410.
 411.
 412.
 413.
 414.
 415.
 416.
 417.
 418.
 419.
 420.
 421.
 422.
 423.
 424.
 425.
 426.
 427.
 428.
 429.
 430.
 431.
 432.
 433.
 434.
 435.
 436.
 437.
 438.
 439.
 440.
 441.
 442.
 443.
 444.
 445.
 446.
 447.
 448.
 449.
 450.
 451.
 452.
 453.
 454.
 455.
 456.
 457.
 458.
 459.
 460.
 461.
 462.
 463.
 464.
 465.
 466.
 467.
 468.
 469.
 470.
 471.
 472.
 473.
 474.
 475.
 476.
 477.
 478.
 479.
 480.
 481.
 482.
 483.
 484.
 485.
 486.
 487.
 488.
 489.
 490.
 491.
 492.
 493.
 494.
 495.
 496.
 497.
 498.
 499.
 500.
 501.
 502.
 503.
 504.
 505.
 506.
 507.
 508.
 509.
 510.
 511.
 512.
 513.
 514.
 515.
 516.
 517.
 518.
 519.
 520.
 521.
 522.
 523.
 524.
 525.
 526.
 527.
 528.
 529.
 530.
 531.
 532.
 533.
 534.
 535.
 536.
 537.
 538.
 539.
 540.
 541.
 542.
 543.
 544.
 545.
 546.
 547.
 548.
 549.
 550.
 551.
 552.
 553.
 554.
 555.
 556.
 557.
 558.
 559.
 560.
 561.
 562.
 563.
 564.
 565.
 566.
 567.
 568.
 569.
 570.
 571.
 572.
 573.
 574.
 575.
 576.
 577.
 578.
 579.
 580.
 581.
 582.
 583.
 584.
 585.
 586.
 587.
 588.
 589.
 590.
 591.
 592.
 593.
 594.
 595.
 596.
 597.
 598.
 599.

chain carboxylic acid, said ester base stock having the following characteristics:

- (i) biodegradability of $\geq 80\%$, as determined by CEC-L-33-T-82;
- (ii) flash point of $\geq 175^{\circ}\text{C}$; and
- (iii) kinematic viscosity of less than 15 cSt at 100°C .

22. An ester base stock as claimed in claim 21, wherein the neopentylpolyol component of said first and said second ester is selected from the group consisting of trimethylolpropane, pentaerythritol, ditrimethylolpropane, dipentaerythritol, neopentylglycol, trimethylolethane and mixtures of two or more of said neopentylpolyols.

23. An ester base stock as claimed in claim 21, consisting essentially of from about 25% to about 85% of said first ester and from about 15% to about 75% of said second ester, based on the weight of said ester base stock.

24. An ester base stock as claimed in claim 23, consisting essentially of about 85% of trimethylolpropane tripelargonate and about 15% of a complex polyol ester comprising, as its reactive components, trimethylolpropane, and an acid mixture consisting essentially of caprylic acid and capric acid, and adipic acid, the weight ratio thereof being in a range from about 2.5:1.0 to 3.0:1.0, caprylic acid-capric acid to adipic acid, said percentages being based on the weight of said ester base stock.

25. An ester base stock as claimed in claim 23, consisting essentially of about 75% trimethylolpropane tripelargonate and about 25% of a

complex polyol ester comprising, as its reactive components, trimethylolpropane, and an acid mixture consisting essentially of caprylic acid and capric acid, and adipic acid, the weight ratio thereof being in a range from about 2.5:1.0 to 3.0:1.0, caprylic acid-capric acid to adipic acid, said percentages being based on the weight of said ester base stock.

26. An ester base stock as claimed in claim 23, consisting essentially of about 70% trimethylolpropane tripelargonate and about 30% of a complex polyol ester comprising, as its reactive components, trimethylolpropane, and an acid mixture consisting essentially of caprylic acid and capric acid, and adipic acid, the weight ratio thereof being in a range from about 2.5:1.0 to 3.0:1.0, caprylic acid-capric acid to adipic acid, said percentages being based on the weight of said ester base stock.

27. An ester base stock as claimed in claim 23, consisting essentially of about 55% trimethylolpropane tripelargonate and about 45% of a complex polyol ester comprising, as its reactive components, trimethylolpropane, and an acid mixture consisting essentially of caprylic acid and capric acid, and adipic acid, the weight ratio thereof being in a range from about 2.5:1.0 to 3.0:1.0, caprylic acid-capric acid to adipic acid, said percentages being based on the weight of said ester base stock.

28. An ester base stock as claimed in claim 23, consisting essentially of about 45% trimethylolpropane tripelargonate and about 55% of a complex polyol ester comprising, as its reactive components, trimethylolpropane, and an acid mixture consisting essentially of caprylic acid and capric

acid, and adipic acid, the weight ratio thereof being in a range from about 2.5:1.0 to 3.0:1.0, caprylic acid-capric acid to adipic acid, said percentages being based on the weight of said ester base stock.

29. A biodegradable two-cycle engine oil composition comprising:

(A) an ester base stock consisting essentially of a blend of (a) a first polyol ester, comprising, as its reactive components, a neopentylpolyol and a C₈-C₁₀ straight chain, saturated monocarboxylic acid and (b) a second complex polyol ester comprising, as its reactive components, a neopentylpolyol, a C₆-C₁₂ dicarboxylic acid and a C₅-C₁₀ straight or branched chain, saturated monocarboxylic acid; and, optionally, a relatively low molecular weight ester comprising, as its reactive components, a C₈-C₁₃ straight or branched chain monohydric alcohol and a C₅-C₁₂ straight or branched chain carboxylic acid, said ester base stock having the following characteristics:

- (i) biodegradability of $\geq 80\%$, as determined by CEC-L-33-T-82;
- (ii) flash point of $\geq 175^{\circ}\text{C}$; and
- (iii) kinematic viscosity of less than 15 cSt at 100°C ; and

(B) a detergent/dispersant additive, said composition having the following characteristics:

- (i) biodegradability of $\geq 80\%$, as determined by CEC-L-33-T-82;
- (ii) flash point of $\geq 175^{\circ}\text{C}$;
- (iii) kinematic viscosity of less than 15 cSt at 100°C ; and
- (iv) miscibility with gasoline, in a fuel/oil ratio of 16:1 to 100:1, of $\leq 110\%$ of reference oil, as determined by ASTM-4682, using

Citgo-93738 as said reference oil for category 3, according to SAE J1536.

Sub
B4

30. A biodegradable two-cycle engine oil composition, as claimed in claim 29, including an ashless additive selected from the group consisting of a polyamide, an alkenylsuccinimide, a boric acid-modified alkenylsuccinimide, a phenolic amine, a succinate derivative or a combination of any two or more of said additives.

31. A biodegradable two-cycle engine oil composition, as claimed in claim 29, including an ash-containing additive selected from the group consisting of sulfonate, an alkaline earth metal, phosphonate, phenate, or a combination of any two or more of said additives.

32. A biodegradable two-cycle engine oil composition as claimed in claim 29 comprising from about 80% to about 90% of said ester base stock and from about 10% to about 20% of said additive, based on the weight of said composition.

33. A biodegradable two-cycle engine oil composition, as claimed in claim 30, comprising about 85% of an ester base stock consisting essentially of a blend of trimethylolpropane tripelargonate and a complex polyol ester comprising, as its reactive components, trimethylolpropane and an acid mixture consisting essentially of caprylic acid and capric acid, and adipic acid, the weight ratio of acid components of said complex ester being in a range from about 2.5:1.0 to 3.0:1.0 caprylic acid-capric acid to adipic acid, and the weight ratio of simple to complex esters in said blend being about 1.0:0.18, and about

Q. Now, you said that you were not sure whether or not the person was a woman, is that correct?

36. A biodegradable two-cycle engine oil composition, as claimed in claim 30, comprising about 85% of an ester base stock consisting essentially of a

blend of trimethylolpropane tripelargonate and a complex polyol ester comprising, as its reactive components, trimethylolpropane and an acid mixture consisting essentially of caprylic acid and capric acid, and adipic acid, the weight ratio of acid components of said complex ester being in a range from about 2.5:1.0 to 3.0:1.0 caprylic acid-capric acid to adipic acid, and the weight ratio of simple to complex esters in said blend being about 1.0:0.80, and about 15% of said additive, said percentages being based on the weight of said composition.

37. A biodegradable two-cycle engine oil composition, as claimed in claim 30, comprising about 85% of an ester base stock consisting essentially of a blend of trimethylolpropane tripelargonate and a complex polyol ester comprising, as its reactive components, trimethylolpropane and an acid mixture consisting essentially of caprylic acid and capric acid, and adipic acid, the weight ratio of acid components of said complex ester being in a range from about 2.5:1.0 to 3.0:1.0 caprylic acid-capric acid to adipic acid, and the weight ratio of simple to complex esters in said blend being about 1.0:1.2, and about 15% of said additive, said percentages being based on the weight of said composition.

38. A method of lubricating a two-cycle engine which comprises bringing the components of said engine which are to be lubricated into contact with an effective amount of the composition of claim 13.

39. A method of lubricating a two-cycle engine which comprises bringing the components of said engine which are to be lubricated into contact with an effective amount of the composition of claim 29.

40. A method as claimed in claim 38, wherein said engine is lubricated with a composition comprising about 85% of an ester base stock consisting essentially of a blend of trimethylolpropane triisostearate and trimethylolpropane tripelargonate, in a weight ratio of about 0.7:1.0, and about 15% of an ashless detergent/dispersant additive selected from the group consisting of a polyamide, an alkenylsuccinimide, a boric acid-modified alkenylsuccinimide, a phenolic amine, a succinate derivative, or a combination of any two or more of said additives, said percentages being based on the weight of said composition.

41. A method as claimed in claim 39, wherein said engine is lubricated with a composition comprising about 85% of an ester base stock consisting essentially of a blend of trimethylolpropane triisostearate and trimethylolpropane tripelargonate, in a weight ratio of about 0.7:1.0, and about 15% of an ashless detergent/dispersant additive selected from the group consisting of a polyamide, an alkenylsuccinimide, a boric acid-modified alkenylsuccinimide, a phenolic amine, a succinate derivative, or a combination of any two or more of said additives, said percentages being based on the weight of said composition.

2025-03-03 14:00:00